

A systematic search for absorption features in the X-ray spectra of ultraluminous X-ray sources

Andrew Sosanya

Mentors: Fiona A. Harrison and Murray Brightman

Ultraluminous X-ray sources (ULXs) are variable, non-nuclear bright X-ray sources that exceed the Eddington luminosity limit for stellar-mass black holes ($10 M_{\odot}$). The discovery of X-ray pulsations from ULXs suggests that certain ULXs may be powered by accretion onto highly magnetized neutron stars that are being spun up. However, past research shows that estimations of the magnetic fields of these neutron stars are still uncertain. We seek to find signatures of magnetic fields through cyclotron resonance scattering features (CRSFs) in ULX-abundant galaxies. Using data from the Chandra and XMM-Newton high-energy X-ray telescopes, we conducted a systematic search for absorption line that could be due to cyclotron resonant scattering and would suggest accretion onto magnetized neutron stars. These lines are prevalent in absorption, and we can estimate the magnetic field if we assume absorption by electrons, where the transition energy is $\Delta E = 11.6(1 + z) - 1(B/10^{12} G) \text{ keV}$, where z is the gravitational redshift. After narrowing down potential sources, we present our findings from the spectral analysis of several ULXs. These findings provide further insight into the analysis techniques for future neutron star-powered ULXs and estimation of their magnetic field strengths.